6.2 Adding/Subtracting Fractions (Rational Numbers)

Properties for Rational Numbers with Addition (same set of properties as for addition w/ integers)

1. Closure

2. Commutativity

3. Associativity

4. Additive Identity

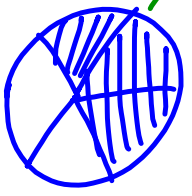
5. Additive Inverse $a + -a = 0 = a + -a$ ex $\frac{2}{3}$ ai $\rightarrow -\frac{2}{3}$

($\mathbb{Q}$ contains all pos. fractions and their additive inverses)

To add fractions with like denominators:

$$\frac{a}{b}+\frac{c}{b}=\frac{a+c}{b}$$

ex $\frac{1}{5}+\frac{2}{5}=\frac{3}{5}$



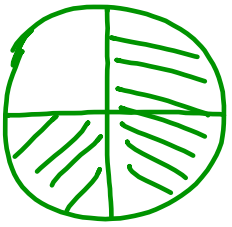
To add fractions with unlike denominators:

$$\frac{a}{b}+\frac{c}{d}=\frac{ad+bc}{bd}$$

$$\frac{a}{b}+\frac{c}{d}=\frac{a}{b}\left(\frac{d}{d}\right)+\frac{c}{d}\left(\frac{b}{b}\right)=\frac{ad}{bd}+\frac{bc}{bd}=\frac{ad+bc}{bd}$$

Addition/Subtraction Models

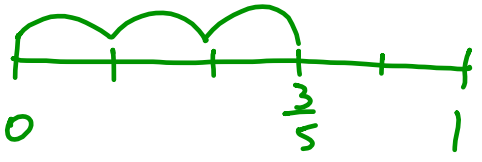
1. Pie chart (circle)



$\frac{1}{4} + \frac{2}{4} = \frac{3}{4}$

2. Number line

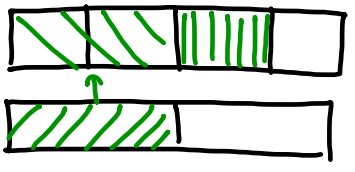
$\frac{2}{5} + \frac{1}{5} = \frac{3}{5}$



3. Fraction Strip

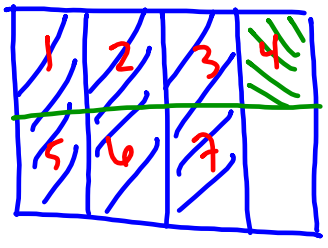
$\frac{1}{2} + \frac{1}{4}$

$= \frac{3}{4}$



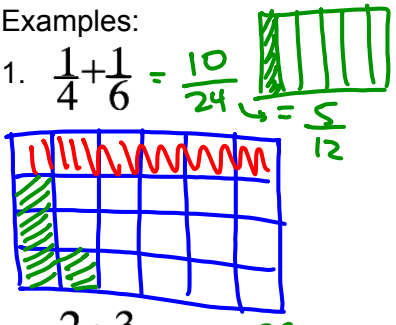
4. Rectagular Cake

$\frac{1}{8} + \frac{3}{4} = \frac{7}{8}$



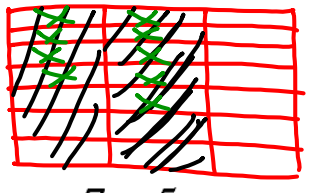
Examples:

1. $\frac{1}{4}+\frac{1}{6}$ $= \frac{10}{24} = \frac{5}{12}$



2. $\frac{2}{5}+\frac{3}{7}$ $= \frac{29}{35}$

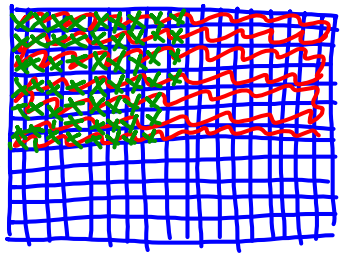
3. $\frac{2}{3}-\frac{3}{7}$ $= \frac{5}{21}$



4. $\frac{7}{12}-\frac{5}{18}$

$= \frac{66}{12(48)_3}$ ^{11}

$= \frac{11}{36}$



5. $3\frac{5}{8}-2\frac{5}{6}$

① $\frac{29}{8}-\frac{17}{6}$

$= \frac{29}{8}\left(\frac{3}{3}\right)-\frac{17}{6}\left(\frac{4}{4}\right)$

$= \frac{87-68}{24}$

$= \frac{19}{24}$

② $3\frac{5}{8}-2\frac{5}{6}$

$= (3-2)+\left(\frac{5}{8}-\frac{5}{6}\right)$

$= 1+\frac{-5}{24} = \frac{19}{24}$

6. $15\frac{1}{4}+17\frac{3}{5}$

$= 32\frac{17}{20}$ or $\frac{657}{20}$

7. Estimate:

$3\frac{1}{6}+8\frac{2}{3}+5\frac{1}{4} \simeq 17$

LCM(12,18) $= 36$

$\frac{7}{12}-\frac{5}{18}$

$= \frac{7}{12}\left(\frac{3}{3}\right)-\frac{5}{18}\left(\frac{2}{2}\right)$

$= \frac{21-10}{36} = \frac{11}{36}$

$3\frac{5}{8} = 3\left(\frac{8}{8}\right)+\frac{5}{8}$

A student added $\frac{3}{4}+\frac{1}{2}$ and obtained $\frac{4}{6}$.

How would you use estimation to show that this answer cannot be correct?

notice $\frac{4}{6} < \frac{3}{4}$

or $\frac{3}{4}+\frac{1}{2}$ has to be bigger than 1

6.2 HW

MC #4) $5\frac{3}{4}$ to mixed #

$$5\frac{3}{4} = \frac{5\cdot 4+3}{4} = \frac{23}{4}$$

$$a\frac{c}{d} = \frac{a\cdot d+c}{d}$$

$$5+\frac{3}{4} = 5\left(\frac{4}{4}\right)+\frac{3}{4} = \frac{5\cdot 4+3}{4}$$

MC #8) (a) $\frac{13}{35} = \frac{1}{5}$, $\frac{27}{73} = \frac{2}{3}$, $\frac{16}{64} = \frac{1}{4}$

(b) $\frac{4}{5}+\frac{2}{3} = \frac{6}{8}$, $\frac{2}{5}+\frac{3}{4} = \frac{5}{9}$, $\frac{7}{8}+\frac{1}{3} = \frac{8}{11}$

(c) $8\frac{3}{8}-6\frac{1}{4} = 2\frac{2}{4}$, $5\frac{3}{8}-2\frac{2}{3} = 3\frac{1}{5}$